A science section digest of current environmental issues in King County

February 2020

Fecal bacteria levels in regional waters – are we making progress?

by Tim Clark

King County scientists recently published Fecal Bacteria in King County Waters: Current Conditions, Long-term Trends, and Landscape Factors, a report that summarized fecal contamination in King County surface waters and assessed the landscape for conditions associated with observed contamination.

Bacterial contamination of Puget Sound, lakes, rivers, and streams is a widespread problem throughout King County.

As of 2019, Washington State Department of Ecology's Water Quality Assessment lists nearly 200 waterbodies in King County as impaired by unhealthy levels of bacteria in the water and a pollution control plan is in place for only about one-third of them. This threatens public and environmental health.

Many commercial and recreational shellfish harvest areas in King County have been closed by bacterial contamination in 2019:

- There are 9,612 acres of commercial shellfish growing areas in King County and about half are open for year-round harvest. The remainder are closed or not monitored. Growing areas remain closed until sufficiently low pollution levels are seen. Additionally, a 124-acre area in Poverty Bay (near Federal Way) is closed from June 1 to November 30 due to seasonal fecal contamination concerns.

- Of the 37 public Puget Sound beaches in King County, over half are closed to shellfish harvest due to fecal contamination.

(continued)

Fecal waste from livestock, wildlife, pets, and humans can pollute surface waters if not properly managed. Many of King County's surface waters suffer from fecal pollution.

(Continued from page 1)

12,112 people were experiencing homelessness in King County, as noted during the annual one-night count across the county in 2018. Over half were unsheltered.

In addition to unsafe living conditions, persons that lack access to sanitary facilities, such as those living in encampments and recreation vehicles, can spread disease and contaminate nearby waterbodies.

Monitoring by King County confirmed that bacterial levels in surface waters are affected by on-site sewage systems (septic systems), runoff from developed areas, and areas with small farms and livestock.

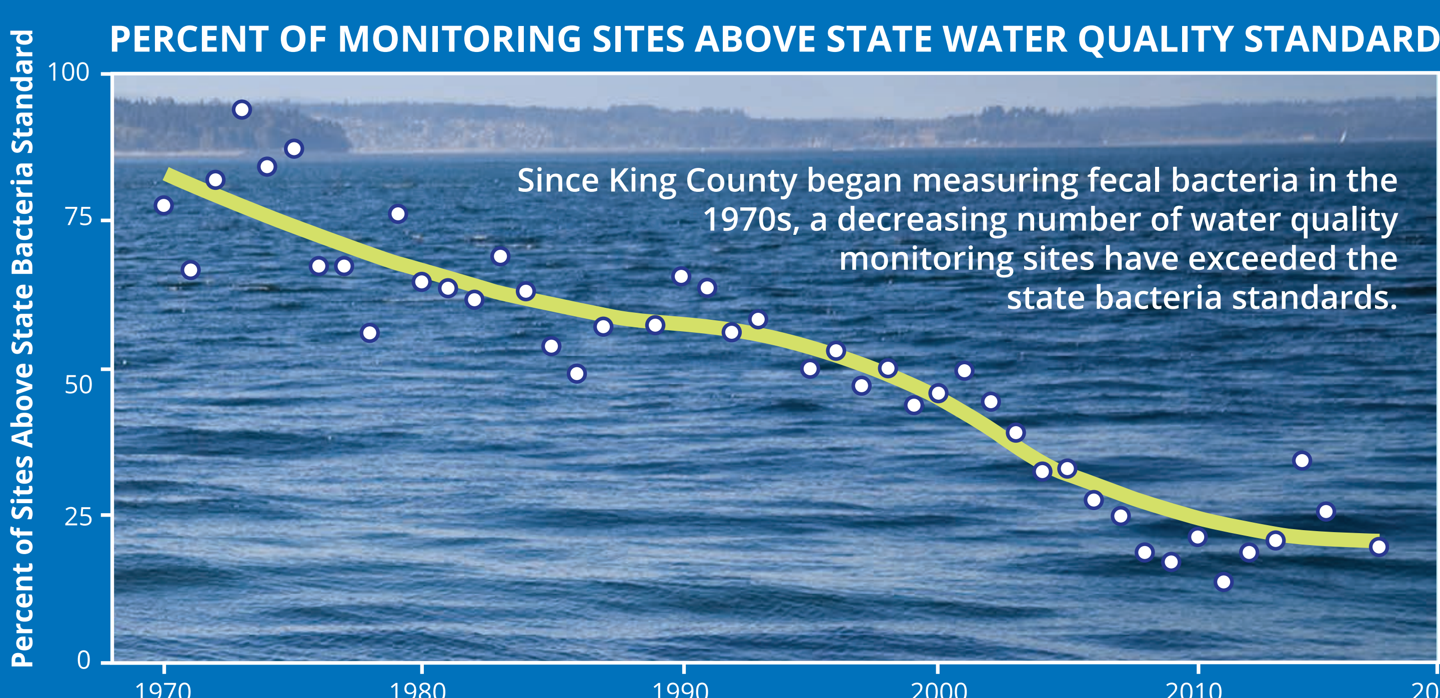
Our analysis linked surface water bacteria levels to land use and environmental factors. Monitoring locations in a watershed with higher numbers of on-site sewage systems, population and/or agricultural land uses, tended to have higher levels of fecal bacteria.

The good news: bacteria levels in surface waters have decreased at most monitoring locations since the 1970s.

The results from our study indicated that bacteria levels have significantly decreased at the majority of long-term freshwater monitoring sites. We also observed a significant decrease in bacteria levels at several marine sites. Results also indicated bacteria levels were only decreasing at a few of the State Department of Health shellfish sites. Even so, none had increasing bacteria levels. We did not attempt to statistically assess the factors contributing to the decreased levels of bacteria in surface waters, but we think that several factors may be driving the decreasing regional trends. Specifically, we suspect the following actions are reducing fecal inputs:

- More effective stormwater management by public agencies and the private sector.
- Connecting septic systems to sewer lines where available or updating aging systems.
- Decreasing agricultural land cover (resulting in less livestock waste generation and land application of manure) and improved manure management at existing farms.
- Increased resident awareness and environmental stewardship leading to such things as better pet waste management, for example.

(continued)



King County and local cities have programs that aim to reduce fecal contamination of surface waters.

King County has reduced bacteria entering surface waters by:

- **Controlling combined sewer overflows** by curbing the frequency and volume of discharge during rainy weather;
- **Partnering with the King Conservation District and property owners to implement farm and manure management plans** (e.g. keeping cattle out of waterbodies);
- **Finding and stopping unlawful discharges to the stormwater system or surface waters;**
- **Outreach and education for residents about water pollution and how to prevent it** (e.g., pick up pet waste, inspect and maintain on-site septic systems); and
- **Requiring point-of-sale septic system inspections for property transfers.**

To ensure that shellfish harvested from King County beaches are safe to eat and swimmers are protected from disease, further fecal pollution controls are likely to be needed.

Bacteria levels in King County surface waters have greatly declined over the past 50 years presumably owing to the success of programs listed above. However, the amount of fecal material in our surface waters continues to threaten public and environmental health. To successfully address remaining fecal contamination, we recommend continued implementation, or the expansion, of existing programs that address:

(1) on-site sewage systems (e.g., proper operation and maintenance, and repairing failures);

(2) problems in built environments (e.g., stormwater treatment, pet waste management, wildlife control, sanitary facilities for homeless people); and

(3) agriculture (e.g., livestock/manure management plans). ■

What are fecal indicator bacteria?

Fecal indicator bacteria are used to assess the microbiological quality of water because, although not typically disease-causing, they are correlated with the presence of several waterborne disease-causing organisms. The concentration of indicator bacteria is a measure of safety for body-contact water recreation or for water consumption.

Human health risks may be assessed using concentrations of specific bacteria genera and species (i.e., Enterococcus spp. or E. coli) or certain bacteria groups (i.e., fecal coliform and streptococci bacteria). Fecal coliforms have been the primary indicator until relatively recently when the U.S. Environmental Protection Agency began recommending Enterococcus or E. coli as better indicators of health risk. Washington State is currently transitioning from fecal coliform to Enterococcus or E. coli water quality criteria. Shellfish bed monitoring will continue to use fecal coliform.

About King County's SCIFYI

King County
Department of Natural Resources and Parks
Water and Land Resources Division
Science and Technical Support Section

Clean Water Healthy Habitat

Section Manager: Dave White

Newsletter Coordinator: Chris Knutson

Designer: Laurel Preston

Web Design/Production: Fred Bentler

Send questions, comments and future story ideas to:

- Debra Bouchard – debra.bouchard@kingcounty.gov, 206-477-4650
- Kate O'Laughlin – kate.olaughlin@kingcounty.gov, 206-477-4789
- Deb Lester – deborah.lester@kingcounty.gov, 206-477-4752

Available on the Web at: www.kingcounty.gov/SciFYI

File: 2002_9792L_SciFYInews.indd 1202M

Para pedir una traducción: 206-477-4800

Alternate formats available
206-477-4800 TTY relay: 711

Science & Technical Support Section's SciFYI

King County Department of Natural Resources and Parks Water and Land Resources Division

A science section digest of current environmental issues in King County

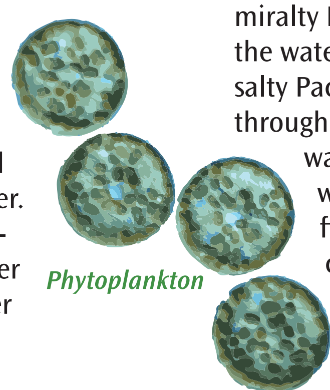
February 2020

Puget Sound salinity: why it matters

by Kimberle Stark

Puget Sound salinity has been higher in 2019 than normal. Salinity refers to the amount of dissolved salt in the water. Why is it important to know the salinity of Puget Sound waters? Before answering this question, we first need to understand the features that make Puget Sound unique and their influences on how water moves in, out, and within the Sound.

Puget Sound is a fjord estuary, meaning it was formed by glaciers. At the end of the last ice age, about 13,000 years ago, as the glaciers advanced and retreated, they carved out narrow, deep valleys that filled with water. All estuaries, including Puget Sound, are partially closed-off waterbodies where freshwater from rivers and streams mixes with salt water from the ocean.



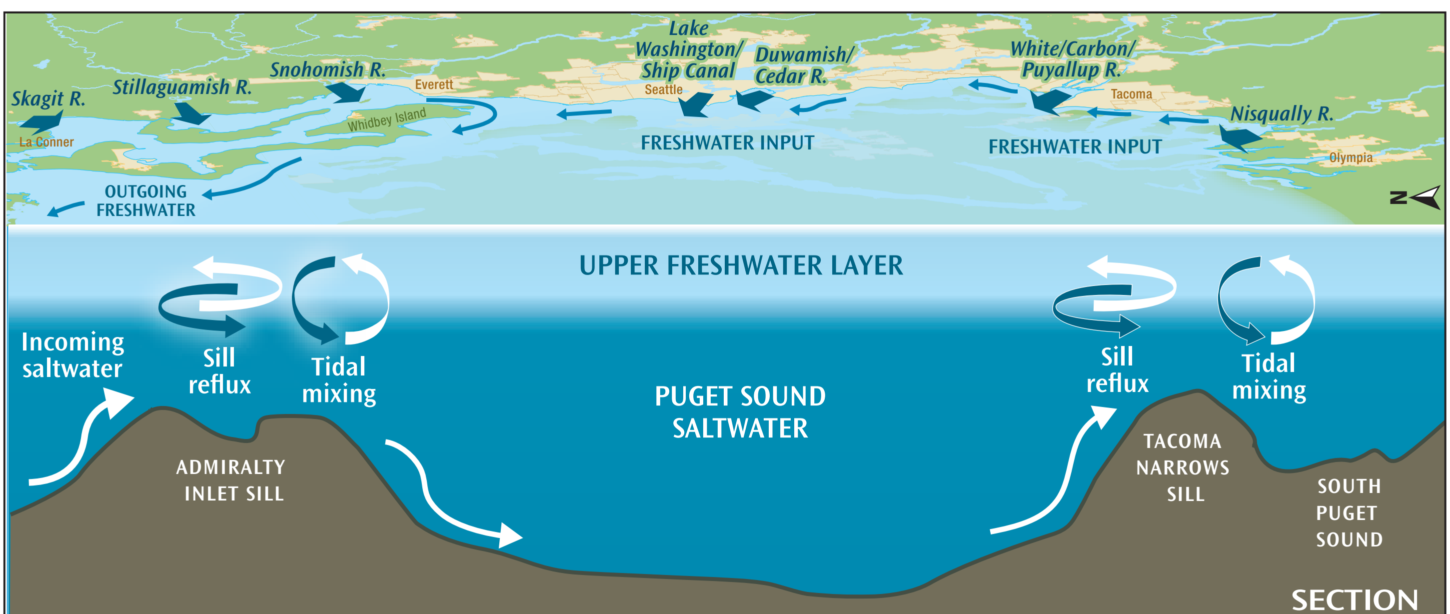
Phytoplankton

Puget Sound consists of four separate but interconnected basins named the Main Basin (subdivided into Admiralty Inlet and the Central Basin), Whidbey Basin, Hood Canal, and South Sound. These basins are separated by underwater ridges, or sills that can block water movement and mix waters across depths. King County marine waters are located within the Central Basin, the area from Admiralty Inlet to Commencement Bay in Tacoma.

Water continually circulates in and out of Puget Sound and is influenced by tidal currents. Because of the Admiralty Inlet and Tacoma Narrows sills, only a portion of the water flows out at any one time (Figure 1). Dense and salty Pacific Ocean water enters Puget Sound at depth through Admiralty Inlet, while the less dense, fresher water flows out of Puget Sound near the surface. So why is salinity important? Salinity has a strong influence on water density, which affects how water circulates and mixes between the top and bottom of the water column and it affects how marine organisms move in the water column. For example, microscopic marine algae, or phytoplankton, are the base of the food web. Phytoplankton need to remain near the surface to get the light they need to grow and reproduce. When density is

(continued)

Figure 1. General illustration of circulation and movement of salt and fresh water in Puget Sound.



similar throughout the water column, phytoplankton have a hard time remaining near the surface.Differences in the density of the water column can also affect the location and dispersal of other organisms, like zooplankton and fish larvae. In addition to affecting living creatures, salinity is also important because it indicates how much freshwater is coming from rivers and rainfall as well as the influence of the Pacific Ocean.

The King County Marine Monitoring Program measures salinity twice a month at 14 locations within the Central Basin. Since February 2019, salinities throughout the Central Basin and most of the enire water column have been higher than normal when compared to the last 10 years. Figure 2 shows this situation in an example from Pt. Jefferson, located in the northern portion of the county. Figure 3 shows salinity at Pt. Jefferson from January through August compared to the difference (anomaly) from the historical average. As you can see, salinity has been higher than normal.

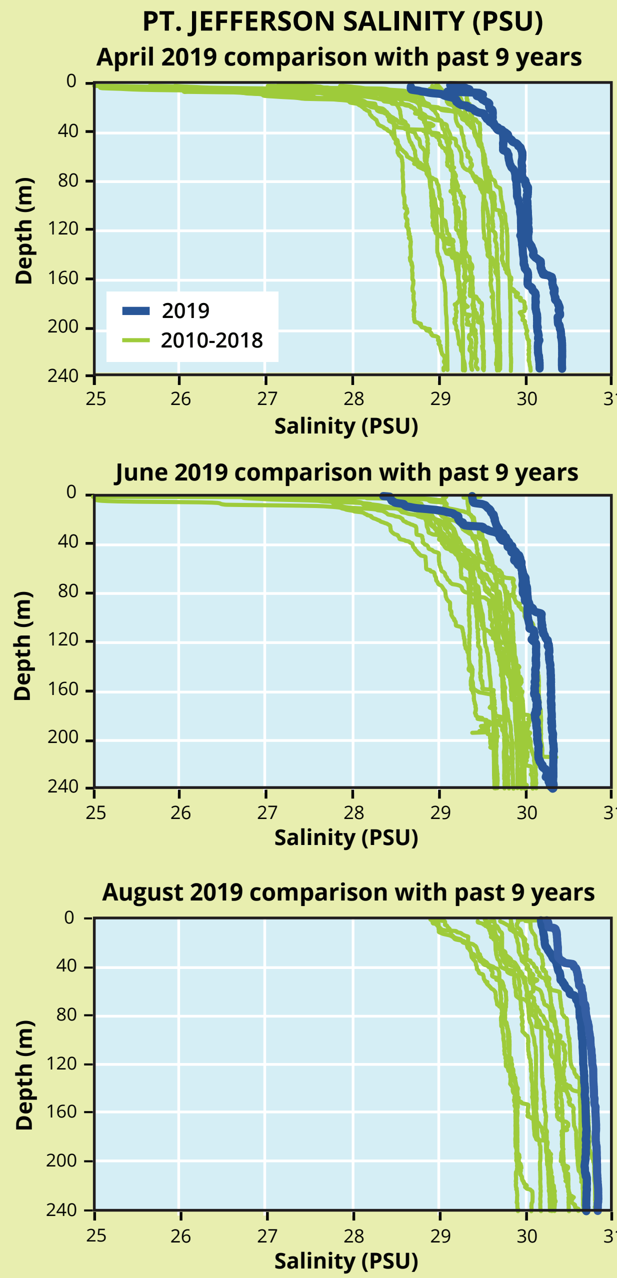


Figure 2 (right).
2019 salinity (shown in dark blue) in April, June and August, at one location compared to results from the past nine years.

PSU=practical salinity unit.

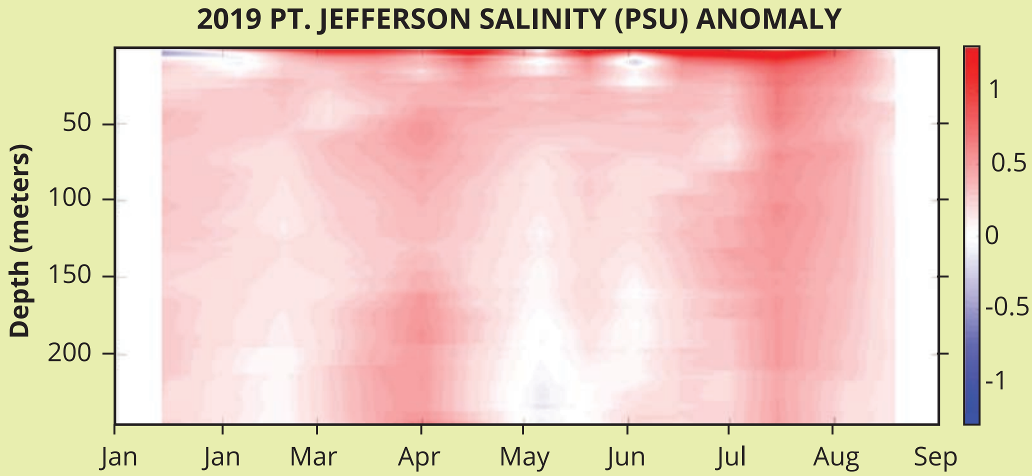
Why is the Sound so salty?

One key reason is the unusually dry weather we had in 2019. January 2019 rainfall was almost two inches below normal, while March was the second driest on record and the driest in the last five decades. This was followed up by less than normal rainfall in May and June. Less rainfall means less freshwater runoff and lower river flows, which means higher salinity at the surface of Puget Sound. It also means that water density is more similar between the top and bottom of the water column and waters mix more.

Increased mixing of surface and deep waters makes it harder for marine algae to stay near the surface. This has impact on plankton and could cause problems for animals higher up in the food web, like fish and marine birds. In addition, the changes in circulation patterns could alter the location and amount of nutrients, dissolved oxygen, and pollutants in the water column. This is why King County works hard to measure and understand trends in the salinity of Puget Sound and why salinity matters.

(continued)

Figure 3 (right).
2019 salinity at one location compared to the difference in the historical average (1999-2013). Red indicates higher than normal and blue lower than normal. Plot created by Stephanie Jaeger.



About King County's SCIFYI

King County
Department of Natural Resources and Parks
Water and Land Resources Division
Science and Technical Support Section

Clean Water Healthy Habitat

Section Manager: Dave White

Newsletter Coordinator: Chris Knutson

Designer: Laurel Preston

Web Design/Production: Fred Bentler

Send questions, comments and future story ideas to:

- Debra Bouchard – debra.bouchard@kingcounty.gov, 206-477-4650
- Kate O'Laughlin – kate.olaughlin@kingcounty.gov, 206-477-4789
- Deb Lester – deborah.lester@kingcounty.gov, 206-477-4752

Available on the Web at: www.kingcounty.gov/SciFYI

File: 2002_9792L_SciFYInews.indd 1202M

Para pedir una traducción: 206-477-4800

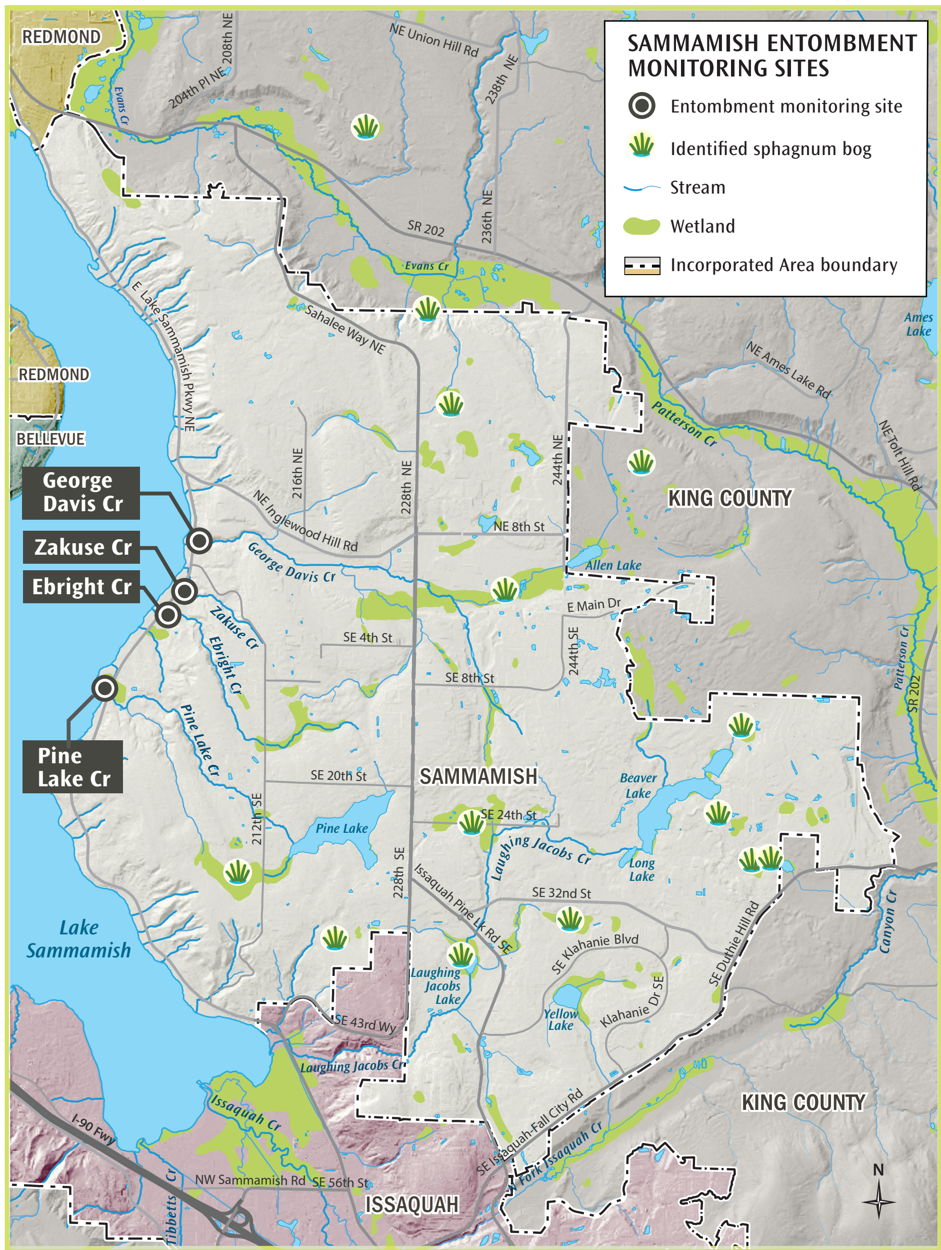
Alternate formats available
206-477-4800 TTY relay: 711

Science & Technical Support Section's
SciFYI
King County
Department of Natural Resources and Parks
Water and Land Resources Division
A science section digest of current environmental issues in King County
February 2020

Measuring sedimentation on kokanee spawning beds to inform effective restoration

By Wafa Tafesh

Kokanee salmon, the little red fish that span less than half the length of its sockeye relative, are a special part of King County's variety of life. Rather than migrating to the ocean to feed or spawn, kokanee salmon live out their entire life in freshwater. With the number of adult kokanee returning to Lake Sammamish falling drastically from 6,988 in the 2015-2016 season to only 19 the following season, fish ecologists have hypothesized that fine sediments, through the process of sedimentation, may be one factor harming the kokanee populations. Sedimentation is the movement of finer sediments that settle on stream or lake beds. The finer sediments, such as silt and clay, may be smothering the eggs while they are developing in the gravel nests (known as redds).



During the kokanee spawning season (November to May), fertilized eggs incubate in gravel streambeds where they depend on water flowing continuously through the gravel. The flowing water carries oxygen to the developing fish and washes away waste products. These important processes can be blocked by sedimentation. In this scenario, sedimentation occurs when fine sediments deposit on and around the larger gravel in the spawning beds where the kokanee eggs incubate. This can suffocate the developing fish and possibly trap the young fish trying to emerge into the river. This

(continued)

suffocation, called entombment, has not been studied in the Sammamish watershed, so we don't know whether it is occurring, nor do we know which streams are most affected in the Sammamish watershed.

King County scientists recently launched a new study to address the questions around the possible impacts of sedimentation on kokanee survival. Daniel Nidzgorski's, "Monitoring Entombment of Kokanee Spawning Beds Sampling and Analysis Plan," summarizes a study designed to look at sedimentation impacts on kokanee's spawning beds in streams of Lake Sammamish. It is designed to answer the following questions:

- How does sedimentation vary within a stream?
- How does entombment compare among streams?
- And what trends are we seeing over time?

Nidzgorski's study, being done at four creeks (Ebright, George Davis, Pine Lake and Zackuse), will provide data to answer these questions. (See map.)

The entombment monitoring sites were chosen because they are located where the stream slope flattens out. As water and sediments flow downstream, we can expect much of the sediment to settle out in flatter stretches where the water slows down.

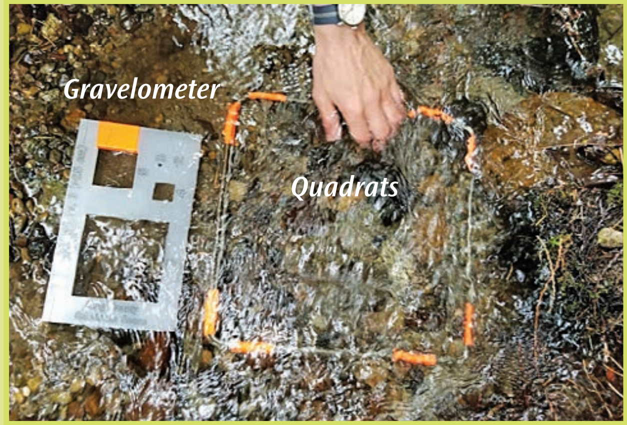
To see how sedimentation changes along the stream we are measuring sediment particle sizes using a gravelometer (see photo) and answering four questions at each monitoring sites on each stream (Crouse et al, 1981):

1. What is the most common particle size?
2. What is the second most common particle size?
3. What is the particle size immediately surrounding the most common particle size?
4. What is the percent of coverage of the most common particle size?

We began the study in 2019. At each sampling point, after the quadrat was set, we got to work, lifting larger pebbles out of the stream and matching them to the gravelometer; seeing what smallest opening in the gravelometer it could fit through. Embeddedness was measured a little differently. We left the larger pebbles in place within the stream and estimated how much of their surface area is covered or surrounded by the sand or finer sediments.

Later, substrate scores for each stream's sampling points were added up from the sum of the answers to the four questions. These scores will help us understand if the sedimentation is in fact harming kokanee embryo survival and health. By focusing on physical sedimentation

(continued)



Sampling tools

A **gravelometer** gives us a systematic way to categorize particle sizes so we can compare changes over time. Particles are given a score from 1 (fine organic material) to 7 (10-25 cm, roughly the size of a soccer ball) using the gravelometer. Embeddedness, the amount of a particle's surface that is surrounded by sand or finer sediments, is scored from 1 (completely or nearly) to 5 (not embedded).

Quadrats, a standard sized frame of 30-cm by 30-cm, are set up at several sampling points at each monitoring site. Here we would sample the middle of the stream, to the left of the middle point, and to the right. We repeated this every 10-meters, moving upstream, for a total of 11 sampling points giving us 33 quadrats per stream.

impacts on stream spawning habitat, we are able to gather data to help inform development and restoration work in the watersheds.

We have at least five years of data collection and observing the habitat of kokanee salmon to go before we will be able to answer the study questions. With enough data, it will be possible to prioritize watersheds, and monitor the effectiveness of restoration efforts or impacts from other changes in the watershed. Ultimately, we are trying to understand more about how to improve adult living habitat conditions in Lake Sammamish, and ensure that kokanee have ample, healthy spawning habitat in the streams. ■

About King County's SCIFYI

King County
Department of Natural Resources and Parks
Water and Land Resources Division
Science and Technical Support Section

Clean Water Healthy Habitat

Section Manager: Dave White

Newsletter Coordinator: Chris Knutson

Designer: Laurel Preston

Web Design/Production: Fred Bentler

Send questions, comments and future story ideas to:

- Debra Bouchard – debra.bouchard@kingcounty.gov, 206-477-4650
- Kate O'Laughlin – kate.olaughlin@kingcounty.gov, 206-477-4789
- Deb Lester – deborah.lester@kingcounty.gov, 206-477-4752

Available on the Web at: www.kingcounty.gov/SciFYI

File: 2002_9792L_SciFYInews.indd 1202M

Para pedir una traducción: 206-477-4800

Alternate formats available

206-477-4800 TTY relay: 711

Science & Technical Support Section's
SciFYI
King County
Department of Natural Resources and Parks
Water and Land Resources Division
A science section digest of current environmental issues in King County
February 2020

A tale of two environmental engineers: the evolving relationship between humans and beavers

by Jen Vanderhoof

The North American beaver is a semi-aquatic mammal that evolved to use water as a key component of survival. Beavers build dams on gently sloping streams to form ponds deep enough to maintain underwater entrances to their lodges. Underwater entrances keep them safe from predators such as coyotes, bears, cougars, and dogs. They also use the ponds as protective cover as they move between their dwelling and the trees and other vegetation they eat. When left to their own devices, a beaver family may build a series of dams along a stream to create a string of ponds that may retain tens of millions of gallons of water.

Beavers, like other wild animals, don't adhere to property lines or plan where the water from their ponds may end up. Challenges for humans arise when beaver ponds flood private property, farmland, roads, and other public infrastructure. There was a time when trapping out the "nuisance" beavers was a fast, simple, and reasonable solution. But now we understand all the benefits to keeping them around whenever possible. Therein lies the rub. More on that further on. First, some historical context.

Beaver history

Beavers were nearly wiped out from this region by around 1850, 170 years ago. In the early part of the 20th century, people started realizing the loss of beavers was harmful to nature, plus fur trappers wanted to be able to trap them once again. So, relocation programs were kicked off all around the country, including in Washington in the 1920s. As beaver populations began to rebound, their numbers were kept in check by trappers.

In 2000, trapping laws changed, making some traps illegal and making it more expensive and difficult to trap beavers recreationally. Around the same time, public agencies and conservation groups all over Puget Sound started doing restoration projects along streams for salmon recovery. These projects typically involved planting trees – trees that are quite attractive to beavers for food and building materials. Trapping plummeted at the same time people were planting beaver food all over the region. While state agencies do not track beaver populations, it is apparent from anecdotal evidence, and the increased number of beaver-related calls to King County since 2000, that beavers are making a substantial comeback.

(continued)

Those last six words will delight some people and give others a knot in their stomach. To one, this news could mean more salmon and wildlife. To another, it could mean the loss of livelihood, home, and property. These opposing reactions are at the core of why King County is dedicating time and resources to addressing the beaver conundrum: how can we humans (excellent manipulators of our environment) coexist with these animals (exceptional manipulators of their environment)? We humans occupy land, homes, and roads where we have a keen interest in preventing flooding, and the beavers provide an astonishing array of ecological benefits, but their work may redirect water to places we find unacceptable.

The ultimate goal of King County's Beaver Working Group is to develop the best, most effective solutions for humans and beavers to successfully co-exist in King County.

The importance of coexisting

King County is looking ahead to a not-so-distant future in which our climate brings more rain and less snow in the winter. That means higher stream flows and more flooding in winter and streams with lower to no flow in summer, resulting in problems for agriculture, drinking water supply, and salmon, just to name a few. Warmer, dryer summers also equate to warmer water temperatures in streams and rivers. King County and the entire Puget Sound region have been working hard for two decades to recover salmon populations, which require streams and rivers with adequate amounts of cold, clean water as well as ample large wood.

What does any of that have to do with beavers? It turns out that those ponds beavers build for survival have a variety of other beneficial functions.

Beaver functions:

1 Beaver ponds not only increase water storage, but that stored water increases groundwater recharge and retention. This stored water is released slowly throughout the summer, which increases flows in the streams below dams, some of which might otherwise go dry in summer.

2 Beaver ponds have a cooling effect on stream water temperatures because of the movement of surface water into groundwater aquifers and subsequent release further downstream when the groundwater resurfaces. This means water temperatures below beaver ponds are often cooler than above them.

3 Beaver ponds, especially when there is a series of them, "roughen" stream channels and can help moderate peak stream flows by slowing flow, which reduces erosion and dangerous flash flooding.

4 Beaver ponds function like filters, collecting and storing sediment and pollutants, keeping downstream water cleaner.

5 Beavers add wood to streams both by cutting down trees for dams and food and by flooding trees, which over time die and fall over. Even in river systems where beavers do not create dams, they build bank dens, which often expose trees roots in the water, which become hiding places for young salmon.

6 Beaver ponds are excellent rearing habitat for young coho salmon and are also used by steelhead.

7 Beaver dams help contribute to more complex stream systems as channels braid around dams and eventually, over the long term, through the stored sediment. These braided channels provide habitat for fish, including juvenile Chinook salmon, and the stored sediment eventually becomes nutrient-rich soil.

8 All that water and wet ground makes areas with beaver dams more resilient to fire which is becoming more a common in western Washington.

9 In terms of biodiversity, beavers create and maintain wetlands that attract a much wider variety of plants and animals than ponds and streams lacking beavers. Trees that die in beaver ponds become habitat for woodpeckers, owls, and other cavity nesters such as bats as well as amphibians and many more animals. The wood is also used by insects, food to the other animals, including salmon. Large and small mammals including mink, otters, cougars, bears, and weasels use ponds created by beavers to drink, feed, and cool down in the summer.

In short, healthy ecosystems in our region include—and in fact may require—beavers.

(Continued0)

There are other compelling, practical, and economy-related reasons to leave beaver dams in place and strive towards coexistence:

1 Removing part or all of a dam is a very short-term solution to a long-term situation. Beavers are hard-working perfectionists—tear down or notch their dam and they will rebuild it – often better and stronger – overnight. They are hypervigilant of any changes to water level and are constantly performing maintenance to make their dams strong and durable. And, they will also take down more trees to use in their repair jobs.

2 Removing a beaver dam can harm salmon by releasing significant stored sediment, and if you do that at the wrong time of year, salmon eggs and baby salmon downstream could suffocate.

3 Removing a dam requires permitting. At a minimum, a Hydraulic Project Approval permit, issued by Washington Department of Fish and Wildlife, to ensure salmon downstream are not being harmed; and in addition a permit from the King County Permitting Division may be necessary.

4 Removing a beaver dam is not a permanent solution. More beavers are likely to move in anywhere from a couple months to a year or two later. Beavers thrive in our large rivers, such as the Snoqualmie or Cedar, so there are always more beavers waiting to take available space.

Living with beavers

Ultimately, as beavers continue to reclaim lands they haven't stepped foot on in nearly 200 years, the two environmental engineers, humans and beavers, will have to find a new balance. But in the meantime, there is a set of tools at our disposal. Constructed solutions such as pond levelers, culvert fencing, and tree protection can solve many problems. To learn more, a summary of beaver management tools and a detailed technical paper are available at kingcounty.gov/beavers.

What the Beaver Working Group is doing

The King County Beaver Working Group is actively seeking innovative solutions. In the meantime, some highlights of the group's current work are listed below.

- King County recently hosted two "Good Neighbor" workshops to learn more about what communities identify as good neighbor behavior where beavers are present on county-maintained lands. A "Planning for Beavers Manual" is being drafted to better guide project managers in anticipating and planning for beavers after a stream restoration project has been built.
- A Fish Passage Committee of the Beaver Working Group has been established to address concerns from state agencies regarding fish passage around beaver dams with flow-control devices. Data collected from field studies will inform future policies and regulations.
- King County Code changes are being drafted to streamline permitting for removal or alteration of beaver dams, including installation of flow-control devices.

Resources currently available

King County Beaver Working Group
Products, technical papers, and resources for beaver management.
kingcounty.gov/beavers

Tulalip Beaver Project
Currently the only local effort actively relocating beavers.
nr.tulaliptribes.com/Programs/Wildlife/Beaver

Beavers Northwest
Specializing in technical advice and installation of flow devices.
beaversnw.org ■

About King County's SCIFYI

King County
Department of Natural Resources and Parks
Water and Land Resources Division
Science and Technical Support Section

Clean Water Healthy Habitat

Section Manager: Dave White

Newsletter Coordinator: Chris Knutson

Designer: Laurel Preston

Web Design/Production: Fred Bentler

Send questions, comments and future story ideas to:

- Debra Bouchard – debra.bouchard@kingcounty.gov, 206-477-4650
- Kate O'Laughlin – kate.olaughlin@kingcounty.gov, 206-477-4789
- Deb Lester – deborah.lester@kingcounty.gov, 206-477-4752

Available on the Web at: www.kingcounty.gov/SciFYI

File: 2002_9792L_SciFYInews.indd 1202M

Para pedir una traducción: 206-477-4800

Alternate formats available

206-477-4800 TTY relay: 711

A science section digest of current environmental issues in King County February 2020

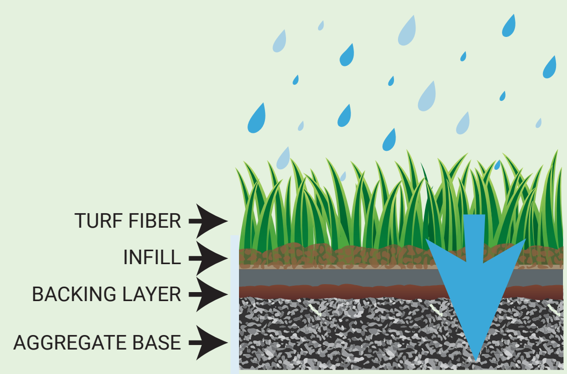
Not all synthetic turf fields are the same when it comes to water quality

By Jenée Colton

If you or your child play soccer or other sports on synthetic turf fields, you may be familiar with crumb rubber. Crumb rubber turf fields contain small rubber pellets ("infill") in between the blades of plastic grass that make the field softer and keep the blades from flattening with use. The technical name for these pellets is "infill." All of King County's, and most of the region's synthetic turf fields use crumb rubber as infill. One reason crumb rubber infill became popular for synthetic turf fields is because it is considered environmentally friendly—it is a recycled product, made from ground vehicle tires, so it diverts waste from our landfills.

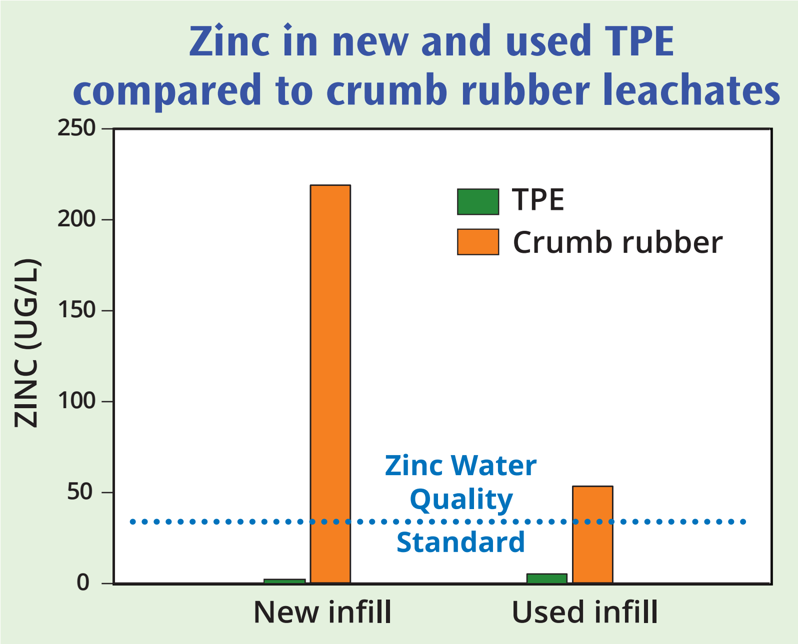
However, over time, researchers nationwide discovered that crumb rubber infill can release zinc into stormwater runoff at levels suspected to be toxic to aquatic animals, such as fish. Because Washington state and King County consider all synthetic turf fields pollution-generating surfaces, stormwater regulations require that runoff from these fields be treated to reduce concentrations of zinc and other metals (called "enhanced stormwater treatment"). Due to this treatment for metals, King County's crumb rubber fields are not suspected of causing environmental problems in our streams. However, construction

(continued)



The problem

Crumb rubber releases zinc to stormwater above the aquatic life water quality threshold, and potentially other chemicals at levels toxic to human health and aquatic life. King County is seeking another more environmentally friendly product.



and maintenance of enhanced stormwater treatment technology is costly and limits design options for playfields. Finding an alternative synthetic turf infill that does not require this level of treatment would provide flexibility and potentially save King County money.

To address this issue, we evaluated the leading alternative to crumb rubber infill to see if it released metals at levels that would require enhanced treatment of runoff, like crumb rubber, and to see if it released other contaminants that may also be toxic to aquatic life or human health. The intent was to avoid selecting a "regrettable substitute" where you replace one problematic product for another which presents a different, and perhaps bigger problem. The top infill alternative was a product called TPE Pro-Max 37 (TPE), a manufactured thermoplastic elastomer made from food-grade plastic.

We collected samples of both new TPE and crumb rubber from the manufacturers, as well as used infill from existing fields. Then, we soaked infill material for 18 hours in mildly acidic water (pH 5). The resulting water (leachate) was tested for more than 100 contaminants and the results were compared to state water quality standards. A greater number of metals exceeded water quality standards in new and used crumb rubber leachates than in TPE leachates. In new and used TPE leachate, no metals were detected at levels expected to cause toxicity to aquatic life or human health. In addition, no other contaminants were present at levels expected to be toxic to human health or aquatic life.

Zinc, and perhaps copper, in leachate from crumb rubber were at levels of significant concern for aquatic life (see graph). Our study results indicate TPE presents less water quality concerns than crumb rubber and does not appear to be a regrettable substitute. Therefore, King County will consider using TPE infill in new playfields as they are scheduled for replacement rather than crumb rubber infill. ■

About King County's SCIFYI

King County
Department of Natural Resources and Parks
Water and Land Resources Division
Science and Technical Support Section

Clean Water Healthy Habitat

Section Manager: Dave White

Newsletter Coordinator: Chris Knutson

Designer: Laurel Preston

Web Design/Production: Fred Bentler

Send questions, comments and future story ideas to:

- Debra Bouchard – debra.bouchard@kingcounty.gov, 206-477-4650
- Kate O'Laughlin – kate.olaughlin@kingcounty.gov, 206-477-4789
- Deb Lester – deborah.lester@kingcounty.gov, 206-477-4752

Available on the Web at: www.kingcounty.gov/SciFYI

File: 2002_9792L_SciFYInews.indd 1202M

Para pedir una traducción: 206-477-4800

Alternate formats available

206-477-4800 TTY relay: 711

A science section digest of current environmental issues in King County
February 2020

Contributors to King County's SciFYI

Tim Clark | Water Quality Planner II/Limnologist

Tim specializes in analyzing and interpreting water quality data for lakes and streams. His work spans from managing a floating wetlands project in a small, eutrophic lake in White Center to large-scale pollutant loading estimates as part of the County's Combined Sewer Overflow Control Program. He joined King County in 2014. Tim has a MS in Environmental Sciences and a MPA from the Indiana University School of Public and Environmental Affairs. His limnological interests include stormwater pollution modeling and management, exploring applications of remote sensing using satellite imagery, and fostering environmental stewardship through civilian science, education, and effective communication.

Jenée Colton | Water Quality Planner III/Ecotoxicologist

Jenée has over 20 years of experience as an environmental scientist. At King County, she designs and conducts studies and manages projects that address chemical contamination of water, sediments, and fish. Jenée leads King County's Marine Fish Tissue Toxics Monitoring program which tracks chemical bioaccumulation in Puget Sound fish over time. She also provides technical services on contaminated sediments, stormwater contamination and treatment, and water quality projects. Her specialties include chemical bioaccumulation in fish, air deposition of chemicals, and PCB contamination issues. Before King County, Jenée worked in the environmental consulting field on cleanup site characterizations and ecological risk assessments.

Kim Stark | Senior Water Quality Planner III/Marine Biologist

Kim is a project manager for King County's Marine Water Quality Monitoring Programs, including the phytoplankton and zooplankton programs. Her work supports a variety of special projects (such as siting of the Brightwater Treatment System marine outfall and eelgrass restoration.
Further, her work involves collaborating with other organizations conducting marine monitoring in Puget Sound (such as UW, Washington State Department of Ecology, and NOAA). Kim's skills and background include but are not limited to chemical and biological analyses (laboratory and field), marine biota, including charismatic megafauna and marine birds.

Wafa Tafesh | Water Quality Planner I

Wafa's work includes water quality sampling, managing water quality data systems, conducting quality assurance reviews, and assisting with report writing. The main portion of her time is spent supporting the Lake Stewardship Program by working with volunteers and providing data support. She also works with the Marine & Sediment Assessment unit to analyze data and create detailed data summaries. In addition, she is a part of the pollution source tracking team, supporting their efforts to identify, quantify, and control surface water pollution by determining relationships between water quality and land use activities.

(continued)

Jen Vanderhoof | **Environmental Scientist IV/ Wildlife Biologist-Ecologist**

Jen's work often focuses on issues related to wildlife and biodiversity (including beaver-related issues) and climate change. She frequently consults on wildlife and habitat-related questions and policies for King County Parks and Recreation Division, the Wastewater Treatment Division, the Director's Office, and the Floodplain Management Section.

King County's SciFYI is published by:

King County
Department of Natural Resources and Parks
Water and Land Resources Division
Science and Technical Support Section

Clean Water Healthy Habitat

Section Manager: Dave White

Newsletter Coordinator: Chris Knutson

Designer: Laurel Preston

Web Design/Production: Fred Bentler

Send questions, comments and future story ideas to:

- Debra Bouchard – debra.bouchard@kingcounty.gov, 206-477-4650
- Kate O'Laughlin – kate.olaughlin@kingcounty.gov, 206-477-4789
- Deb Lester – deborah.lester@kingcounty.gov, 206-477-4752

Available on the Web at: www.kingcounty.gov/SciFYI

File: 2002_9792L_SciFYInews.indd 1202M

Para pedir una traducción: 206-477-4800

Alternate formats available

206-477-4800 TTY relay: 711